ABSTRACT OF THE DISCLOSURE

An image detection apparatus including a field emission array and signal transmission circuits in communication with pixels of the field emission array. The field emission array includes a p-type substrate with an array of n-wells therein. Emitter tips, in communication with the n-wells, protrude from an emission surface of the p-type substrate. A detection surface of the p-type substrate is located opposite the emission surface thereof. Each signal transmission circuit of the field emission array includes a capacitor, a baseline potential transistor, and a signal transmission transistor. A first side of the capacitor communicates with a corresponding n-well of the field emission array. A second side of the capacitor communicates with the baseline potential transistor and the signal transmission transistor. The baseline potential transistor and the signal transmission transistor may share a drain. As radiation, such as visible light or near infrared radiation, impinges the detection surface of the field emission array, electron-hole pairs are created in p-n junctions between the p-type substrate and the n-wells. As a result, electrons are transferred from the impinged p-n junctions into the n-well adjacent thereto. The charge created in the n-well represents the intensity or wavelength of the radiation that has impinged the p-n junction. A signal representative of the wavelength or intensity of the impinging radiation is transmitted by the signal transmission circuit, and may be scanned by a scan circuit. Upon applying a relatively positive potential to an extraction grid associated with the field emission array, the excess electrons in n-wells may be emitted from an emitter tip adjacent the n-well. The emitted electrons may impinge a corresponding display pixel of a display so as to create a visible image thereon.